ALLEGED FAILURE TO PROVIDE SUPPORT FOR AMENDMENTS TO THE DISCLOSURE

The Examiner has asserted that the January 22, 2003 Response was defective, in part because of an alleged failure to provide support for "the new material added to the disclosure." The Examiner has not made it clear what new material she is referring to, and Applicant contends that no new material was added to the disclosure. The various amendments that were made to the disclosure did not introduce new matter, as was stated in connection with the January 22, 2003 response. Nonetheless, to advance prosecution of this case, support for each amendment made in the January 22, 2003 response is outlined below.

The first amendment to the disclosure made in the January 22, 2003 response was the substitution of new Figures 2, 3 and 8. These amendments were made in response to the Examiner's objections to these drawings. Specifically, the Examiner objected to these figures because the reference lines associated with certain items did not "point directly to the elements associated with each of these reference numbers." To overcome the Examiner's objection, the reference lines were extended to point directly to the appropriate items. Support for these amendments occurs throughout the specification, most notably in figures themselves. The fact that the Examiner was able determine that the reference lines did not point directly to the relevant items indicates that the Examiner was able to identify the relevant items in the figure. Thus adequate support for these amendments were present in the originally filed figures.

The second amendment to the disclosure made in the January 22, 2003 response was the filing of a substitute abstract. This substitution was made in response to the Examiner's objection that the abstract did not "comprise a concise statement summarizing the construction and steps associated with the inventive apparatus and method" and because it used the phrase "The present invention is directed to...." As indicated by the redline copy of the abstract (filed January 22, 2003) showing the changes between the originally-filed abstract and the substitute abstract, two changes were made. First, as clearly requested by the Examiner, the "directed to" language was deleted. Second, the following four sentences were added:

> Air is taken into the enclosure and heated by the electronic equipment. The air is then expelled through a heat exchanger, which cools the exiting air. The exiting air is cooled using an external source of cooling liquid, which absorbs the heat from the exiting air. This absorbed heat is then expelled from the liquid outside of the environment containing the enclosure.

Support for this addition appears throughout the specification, as these sentences were intended to "comprise a concise statement summarizing the construction and steps associated with the inventive apparatus and method." However, to advance this application toward prosecution on the merits, specific support for these statements is as follows.

The statement that "Air is taken in into the enclosure and heated by the electronic equipment" may be found, for example, in the originally filed specification at page 2, line 30 through page 3, line 1. Support for the statement that "The air is then expelled through a heat exchanger, which cools the exiting air" may be found, for example, in the originally filed specification at page 3, lines 1–2. The statement that "The exiting air is cooled using an external source of cooling liquid, which absorbs the heat from the exiting air" is supported, for example, by page 2, lines 2–4 of the originally filed specification. Finally, support for the statement that "This absorbed heat is then expelled from the liquid outside of the environment containing the enclosure" may be found, for example, at page 4, lines 1–2. Support for each of these statements may also be found at other locations throughout the specification. However, Applicant's attorney notes that each of these statements was taken from the section of the disclosure entitled "Summary of the Invention" in accordance with the Examiner's directive to provide an abstract that is a "concise statement summarizing the construction and steps associated with the inventive apparatus and method."

The third amendment to the disclosure was the replacement of the paragraph on page 9, lines 3–10 of the specification. Prior to amendment, this paragraph included the statement that "Because the air is always contains a relatively low amount of water as compared to saturation, the possibility of condensation is virtually non-existent." The Examiner specifically objected to this statement as "generally incomprehensible." One of ordinary skill in the art would understand that this sentence merely contains an extraneous word — *i.e.*, "is" — which was included as the result of a typographical error. The amendment deleted this extraneous word, rendering the sentence comprehensible. Support for this amendment, therefore, occurs at exactly the same point in the specification in which the amendment was made.

The fourth amendment to the disclosure was the replacement of the paragraph on page 11, lines 16–23. As indicated by the redline copy, the only changes in this amendment was to change the reference numeral of the thermostatic valve from 330 to 320. The use of reference number 320 was the result of a typographical error, as is clearly shown by reference to the

paragraph immediately preceding the amendment, in which the thermostatic valve is associated with reference numeral 320. Also, the third reference to the thermostatic valve in the amended paragraph used reference numeral 320. Therefore, each of these references provides support for this amendment.

The fifth and final amendment to the disclosure was the replacement of the paragraph beginning on page 11, line 24. As shown by the redline copy, in the second line of this paragraph, enclosure the reference to "cabinet 210" was changed to enclosure 210. The reference to cabinet was inadvertent as item 210 is referred to as an enclosure throughout the specification, including several references in the amended paragraph.

ALLEGED DEFICIENCIES RELATING TO NEW CLAIMS 18 AND 19:

The Examiner has further asserted that the January 22, 2003 Response was defective because of an alleged failure to provide support for newly added claims 18 and 19 and because the applicant "failed to point out the specific distinctions believed to render these newly added claims patentable over the prior art of record."

First, the Examiner is in error that the new claims were not distinguished over the prior art. Newly added claims 18 and 19 depend from claims 7 and 12, respectively. In turn, claims 7 and 12 depend from independent claims 1 and 8, respectively. Both of these independent claims were addressed in Applicant's earlier response. Because a dependent claim necessarily incorporates each limitation of its base claim and any intervening claims, claims 18 and 19 are allowable for at least the reasons advanced for the allowability of claims 1 and 8 in the January 22, 2003 response.

With regard to support for newly added claims 18 and 19. Support for these claims occurs, for example, in originally filed claims 7 and 12 as well as in the specification at page 6, lines 3–10.

In view of the foregoing, it is respectfully requested that claims 1-19 be reconsidered and allowed or that the Examiner address the substantive aspects of the January 22, 2003 response.

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- **Please amend the abstract as follows.**

The present invention is ~~directed to~~ a cooling apparatus and method, and more particularly, an apparatus and method for cooling the air exiting an electronics enclosure. Air is taken into the enclosure and heated by the electronic equipment. The air is then expelled through a heat exchanger, which cools the exiting air. The exiting air is cooled using an external source of cooling liquid, which absorbs the heat from the exiting air. This absorbed heat is then expelled from the liquid outside of the environment containing the enclosure. Cooling the air exiting the enclosure causes the enclosure to present a neutral heat load to a room containing such an enclosure. Cooling the exiting air obviates the necessity of increasing the room air conditioning capacity to account for the heat added to the room by the electronics within the enclosure. Further, the invention decreases the possibility of moisture condensation within the enclosure and also provides a more efficient cooling system than is available from prior art devices and techniques.

- **Please amend the paragraph on page 9, lines 3-10 with the following.**

Conversely, using the present invention, the ambient air enters the enclosure at a typical temperature of 75 degrees Fahrenheit and a typical relative humidity of 50 percent. The air is heated by the electronic components to a typical temperature of 95 degrees Fahrenheit. This decreases the relative humidity of the air to approximately 26 percent. When the heat is removed by the heat exchanger, the relative humidity again increases to a typical value of 50 percent. Because the air ~~is~~ always contains a relatively low amount of water as compared to saturation, the possibility of condensation is virtually non-existent.

- **Please amend the paragraph on page 11, lines 16 – 23 with the following.**

Thermostatic valve ~~330~~ 320 has a thermostatic operator 322 that changes the valve position according to temperature control. A temperature sensor and other required controls (not shown) operate thermostatic valve ~~330~~320. The valve controls the flow of cooling fluid in the heat exchanger and ensures that the air exiting the heat exchanger is at the same temperature as the room temperature of the computer room in which the enclosure is housed. Thermostatic

valve 320 attaches to a tee coupling 312 that connects the valve to adapters 310, 310'. Adapters 310, 310' connect to the external cooling source and returns cooling fluid to the external cooling source.

- **Please amend the paragraph on pages 11-12, lines 24 - 4 with the following.**

Another embodiment of the invention is illustrated in Figure 8. In this embodiment, cooling apparatus 250 is contained within the ~~cabinet~~ enclosure 210 and mounted on rack 220. The general principles of operation of this embodiment are substantially the same as the embodiments discussed above, however, the airflow path is different. In the airflow path of the present embodiment, air is drawn in through the front 212 of enclosure 210. After passing through electronics 240 and absorbing heat therefrom, the air passes through the interior of enclosure 210 and is drawn back through cooling apparatus 250. Cooling apparatus 250, which operates in the same manner as described for the previous embodiment absorbs the heat from the air flow and rejects this heat into the cooling fluid delivered to the external source (not shown). Blower 280 draws air through the cooling apparatus, which may be of the designs that are known in the art. The cooled air then returns to electronics 240 again traveling through enclosure 210.

APPENDIX: REDLINE COPY OF CLAIMS
SHOWING CHANGES RELATIVE TO PREVIOUS VERSION

1. (AMENDED) A cooling system for an enclosure containing heat-producing equipment, ~~said~~the cooling system comprising an air-to-liquid heat exchanger~~;~~, wherein ~~said~~the heat exchanger absorbs heat from air exiting ~~said~~the enclosure and expels the heat outside an environment containing ~~said~~the enclosure.

2. (AMENDED) The cooling system of claim 1, wherein ~~said~~the heat exchanger further comprises an air vent, whereby air present in ~~said~~the heat exchanger is expelled when ~~said~~the heat exchanger is charged with liquid.

3. (AMENDED) The cooling system of claim 1, further comprising a fan situated to move air through ~~said~~the heat exchanger.

4. (AMENDED) The cooling system of claim 3, wherein ~~said~~the fan is selected from the group consisting of a centrifugal blower, a cross-flow blower, an axial fan and a plug fan.

5. (AMENDED) The cooling system of claim 3, wherein ~~said~~the heat exchanger and ~~said~~the fan are attachable to ~~said~~the enclosure.

6. (AMENDED) The cooling system of claim 1, further comprising a valve for regulating ~~refrigerated~~cooling liquid flow through ~~said~~the heat exchanger.

7. (AMENDED) The cooling system of claim 6, further comprising:

a temperature sensor for sensing ~~a~~the temperature of air exiting ~~said~~the heat exchanger; and

a temperature controller coupled to ~~said~~the sensor ~~and~~ for modulating ~~said~~the valve in response to ~~said~~the temperature of ~~said~~the air exiting ~~said~~the enclosure. ~~a temperature approximately equal to the air in the environment.~~

8. (AMENDED) An enclosure containing heat-producing equipment, comprising:

an air inlet for admitting air from an environment containing ~~said~~the enclosure, wherein ~~said~~the air absorb~~sing~~ heat from ~~said~~the equipment;

an air outlet for expelling the heated air from ~~said~~the enclosure; and

an air-to-liquid heat exchanger adjacent to ~~said~~the air outlet, ~~said~~the heat exchanger absorbing heat from ~~said~~the heated air and expelling ~~said~~the heat outside ~~said~~the environment using a ~~refrigerated~~cooling liquid as a heat transfer medium.

9. (AMENDED) The enclosure of claim 8, further comprising a fan disposed to force air through ~~said~~the heat exchanger.

10. (AMENDED) The enclosure of claim 9, wherein ~~said~~the fan is selected from the group consisting of a centrifugal blower, a cross-flow blower, an axial fan and a plug fan.

11. (AMENDED) The enclosure of claim 10, further comprising a modulating valve for regulating ~~refrigerated~~cooling liquid flow through ~~said~~the heat exchanger.

12. (AMENDED) The enclosure of claim 11, further comprising a temperature sensor sensing temperature of the air exiting ~~said~~the heat exchanger and a temperature controller modulating ~~said~~the valve in response to ~~said~~the temperature exiting the heat exchanger. ~~to ensure that the air exiting said heat exchanger is at a temperature approximately equal to a temperature of said~~ environment.

13. (AMENDED) An enclosure containing heat-producing equipment, comprising:

an air inlet for admitting air from an environment containing ~~said~~the enclosure, ~~said~~the air absorbing heat from ~~said~~the equipment,

an air outlet for expelling the air from ~~said~~the enclosure;

means for exchanging heat from the air with a ~~refrigerated~~cooling liquid;

whereby the air returns to ~~said~~the environment at a temperature ~~approximately~~ equal to the ambient temperature of ~~said~~the air in the environment.

14. (AMENDED) The enclosure of claim 13, further comprising means for moving the air through ~~said~~the means for exchanging heat.

15. (AMENDED) A cooling apparatus for an enclosure containing heat-producing equipment, comprising:

an air-to-liquid heat exchanger installed in ~~said~~the enclosure, ~~said~~the heat exchanger absorbing heat from air passing through ~~said~~the heat exchanger and rejecting the heat outside an environment containing ~~said~~the enclosure; and

a fan disposed to induce airflow through ~~said~~the heat exchanger.

16. (AMENDED) A method for cooling an enclosure containing heat-generating equipment, the method comprising:

drawing air into ~~said~~the enclosure from an environment containing ~~said~~the enclosure;

passing the air in the vicinity of ~~said~~the heat-generating equipment to absorb heat from ~~said~~the equipment;

passing the heated air through an air-to-liquid heat exchanger, whereby a ~~refrigerated~~cooling liquid absorbs heat from the air;

returning the air to ~~said~~the environment containing the enclosure; and

rejecting heat from ~~said~~the ~~refrigerated~~cooling liquid outside ~~said~~the environment containing ~~said~~the enclosure.

17. (AMENDED) The method of claim 16, further comprising modulating ~~refrigerated~~cooling liquid flow through the heat exchanger so as to regulate ~~a~~ the temperature of ~~said~~the air returned to ~~said~~the environment ~~at a temperature approximately equal to a~~to the ambient temperature of ~~said~~the environment containing the enclosure.

18. (NEW) The cooling system of claim 7, wherein the heat exchanger cools the temperature of the air exiting the enclosure to equal the ambient temperature of the air in the environment containing the enclosure.

19. (NEW) The cooling system of claim 12, wherein the heat exchanger cools the temperature of the air exiting the enclosure to equal the ambient temperature of the air in the environment containing the enclosure.